



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

Information Sheet #1

¹Electrical Facts and Safety

MARITIMEELECTRIC

A FORTIS COMPANY

P.O. Box 1328, 180 Kent Street,

Charlottetown PE C1A 7N2

Telephone: (902) 629-3799 Facsimile: (902) 629-3665

Toll Free: 1-800-670-1012

Electricity should be respected, not feared. Electricity will always seek the easiest path to ground. This is true whether the electricity comes from a household lighting circuit, a high voltage power transmission line or from lightning. Any person who places him or herself between any two energized conductors, or any energized conductor and ground, will become part of an electrical circuit. This can kill or cause serious injury.

Voltage is the force that causes the flow of electricity (measured in volts).

Current is the rate of flow (measured in amps).

Resistance is effect of friction on the flow of electricity (measured in ohms),

All materials conduct electricity in varying degrees. Insulators, such as glass, conduct electricity in quantities too small to be measured, whereas conductors, such as metal, conduct electricity readily in large amounts. Wood, earth and rubber tires are classified as semi-conductors and depending on conditions such as moisture content and contaminants can conduct large amounts of electricity.

Most electrical fires originate in equipment operating below 750 volts. In the electric industry, this is referred to as low voltage. Home heating systems and home appliances operate at 120/240 volts.

Although the hazard is increased with high voltage installations (greater than 750 volts), it is important of emergency personnel to realize the hazards of even relatively low voltages.

¹ <http://www.maritimeelectric.com>



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN WORKING NEAR ENERGIZED ELECTRICAL EQUIPMENT

Because electricity always seeks the quickest, easiest path to ground, electrical systems use conductive grounding rods to ensure that any stray electricity is returned to earth safely. These rods are driven eight feet or more into the ground to ensure deep dispersal of the power. If, however, electricity is released onto the ground, as when a live wire lies on the ground, the electricity will fan out from the point of contact.

There is rippling effect like dropping a pebble into calm water. In the pool of water, the wave created at the point of contact gets smaller as it rings out. Similarly, in this pool of electricity, the energy is at full system voltage at the point of ground contact, but as you move away from the contact point, the voltage drops progressively. This effect is known as *ground gradient* and a knowledge of how it operates may some day save your life.

The ground gradient, or voltage drop, creates two problems. It's known as step potential and touch potential.

Assume that a live downed wire is touching the ground and has created a pool of electricity. If you were to place one foot near the point of ground contact (at x voltage) and your other foot a step away (at y voltage), the difference in voltage would cause electricity to flow through your body. This effect is *step potential*. Similarly, electricity would flow through your body if you were to place your hand on an energized source, while your feet were at some distance from the source. The difference in voltage in this case is referred to as *touch potential*.

If you touch an energized wire or another energized object and the ground at the same time, you may get killed or injured.

Before any treatment can be given to a victim, the danger must be removed. In some cases the circuit can be turned off, in others it cannot. Don't expose yourself to risk while trying to eliminate the danger. Always assume that wires are live and dangerous.

- Inform the utility as soon as possible and qualified utility staff will be sent to remedy the situation.



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN WORKING NEAR ENERGIZED ELECTRICAL EQUIPMENT

In some distribution systems the power lines may be fed from several sources or directions, therefore the ends may still be alive and hazardous. The power may also be turned backed on automatically through automated equipment or processes.

- Park your vehicle well away from any fallen wires, at least 20 to 25 feet and examine the surrounding area carefully.
- Locate all wire ends and ensure that no one makes contact with any energized objects.
- Keep people away from any object even those some distance away that may be energized by live wires.

The effect of electricity on the body depends on the amount of current and the length of time the body is exposed to it. The higher the current, the less time a human can survive the exposure. The path of electricity through the body is also critical. For example, current passing through the heart or brain is more life-threatening than current passing through the fingers. It takes approximately 1,000 milliamps (1 amp) of current to light a 100-watt bulb.

it is the amperage that kills or injures but the voltage which pushes the current through the body, is also important,

When a victim is exposed to household voltages, he or she may suffer a muscle spasm and may be locked on to the electrical source until the circuit is turned off or until the victim is dragged clear, often by the weight of his or her body falling clear of the contact. Relatively long periods of contact with low voltages are the cause of many electrical fatalities in the home or at work.

At very high voltages the victim is often quickly blasted clear of the circuit. This result is less internal damage, such as heart failure, but terrible surface burns on the body at the entrance and exit of the current.

Contractions of chest muscles, causing breathing difficulty and unconsciousness
Temporary paralysis of the respiratory organs resulting in failure to breathe
Ventricular fibrillation of the heart
Burns to tissue at the entrance and exit points
Fractures caused by muscle spasm

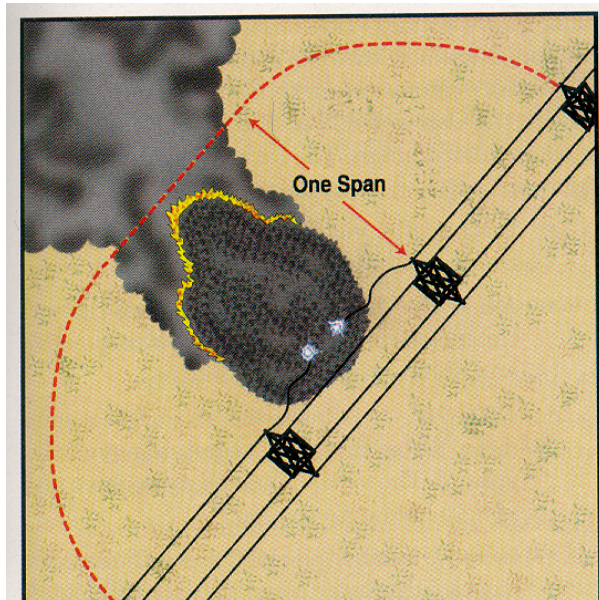


Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

Information Sheet #2



Reprinted by permission
from IFSTA, "Essentials of
Firefighting", 4th Edition

Figure 1 Ground gradient area effects

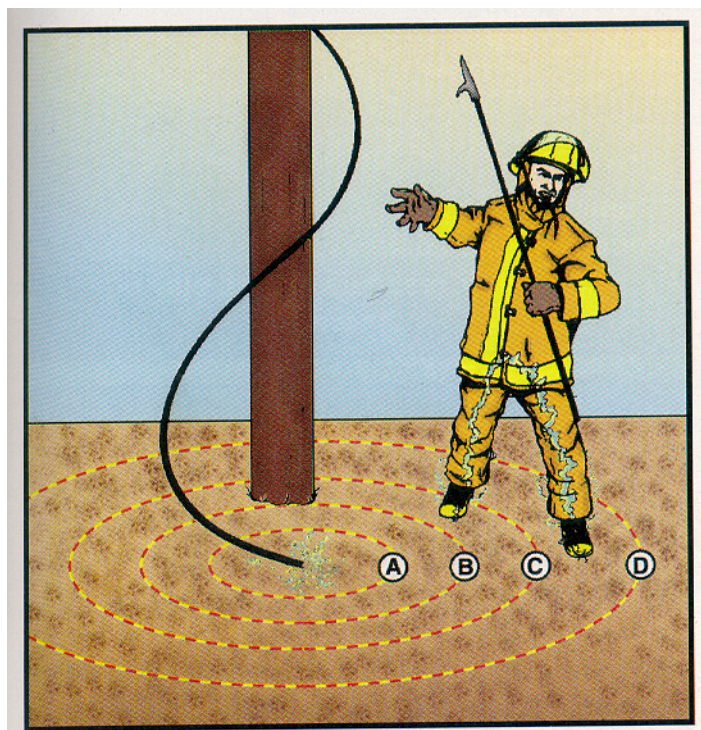


Figure 2 Ground gradient step potential



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

Information Sheet #3

Hazardous Condition Alert

Responsibility

Responsible ECC

Action

1. Learns of hazardous condition at incident.
2. Record type of hazardous condition and record time.
3. Transmit three alert tones.
4. Announce the hazardous condition to all units assigned to incident.
5. Confirm receipt of announcement with each unit.
6. Advise Incident Commander (IC) of any unit(s) not acknowledging announcement and record time.
7. Continue, with IC attempting to contact units not acknowledging announcement.
8. Confirm with IC when all units acknowledge announcement.
9. Contact the appropriate agency or company to abate the hazard.
10. Document contacts made and actions to be taken.
11. Advise IC of contacts made and estimated time of arrival.



Fire Protection Training

Procedures Handbook 4300

SAFETY PRECAUTIONS WHEN
WORKING NEAR ENERGIZED
ELECTRICAL EQUIPMENT

**THIS PAGE
INTENTIONALLY
LEFT BLANK**